VHA TELESURGERY TOOLKIT March 2005

Developed by the:

VHA Telesurgery Field Work Group
Scott Hundahl, MD Chair

VHA Telehealth Strategic Healthcare Group
Adam Darkins, MD, MPH, FRCS Chief Consultant

VHA Surgical Service
Ralph De Palma, MD National Director

Contents

Section 1: Introduction, Background, and Use of the Toolkit

Introduction

This toolkit represents the collaborative effort of:
1. VHA staff and clinicians involved in delivering telesurgery services, and
2. The "VHA Telehealth Strategic Healthcare Group."

Background

Although the practice of surgery depends heavily on physical examination and the delivery of physical surgical interventions, the diagnosis of surgical conditions, the coordination of care for many surgical conditions, and the triage of surgical patients, can be favorably influenced by the availability of telesurgical consultation.[1-13] Moreover, the advent of telepresence surgery,[14, 15] remote telepresence,[16-18] intra-operative consultation,[17, 19, 20] and remarkable "surgery-at-a-distance" technologies,[8, 21-24] offers a wide range of educational[20, 25, 26]and practical possibilities.

Currently with the VHA, two major categories of telesurgical consultation are already in use:
1. Asynchronous or "store-and-forward" telesurgery,[27-33] and
2. Real-time interactive telesurgery.[5, 30, 34-37]

Store-and-forward telesurgery involves combining text files with digital radiographic and photographic images. These are then interpreted by a consulting surgeon at some later time and usually at a distant location. In contrast, real-time interactive telesurgery involves patient-consultant interaction via live interactive video. This particular toolkit addresses telesurgery consultation using both asynchronous store-and-forward and real-time videoconferencing modalities.

Current telesurgery interactions within the VHA are between/among larger VA medical centers (aka “VAMC’s”) and Community Based Outpatient Clinics (aka "CBOC’s"). VA-private telesurgery sharing agreements and other collaborations are underway,[38] but are beyond the scope of this toolkit.

By intent, this toolkit will not specifically address home telesurgical consultation or follow-up. Home telehealth is addressed extensively in a separate "VHA Home Telehealth Toolkit," which complements the information contained herein.

Using this toolkit

This toolkit attempts to harmonize the practices and procedures used in telesurgery within the VHA for the benefit of patients, practitioners, and staff. Such harmonization of processes/procedures impacts on both:
1. Establishing a new telesurgery service in a system or VISN, and
2. Revising or reviewing an existing telesurgery service

Ideally, this toolkit should be used as a resource by a "Telehealth Steering Group" with overall responsibility for both telemedicine and telesurgery health services. Multidisciplinary composition of such a group is deemed mandatory. Typical composition is as follows:

1. The lead clinician for the telesurgery, as well as lead clinicians representing other telehealth/telemedicine specialties.
2. The system and/or network's telemedicine coordinator.
3. A member of the appropriate executive leadership team
4. A member providing high-level expertise representing Information Technology (IT).
5. The system or network credentialing coordinator
6. A suitably expert representative from Health Information Management Systems (HIMS)
7. The system or network's Information Security Officer
8. A patient representative, preferably someone who currently enjoys the benefits of one or more telehealth programs.

This toolkit should be viewed as a template for the discussion/planning/oversight of essential components. For those initiating a new telesurgery program, a few key questions frame the major topics:

1. What other specialty healthcare services are involved? Which other services can benefit? Are any services currently using telehealth in the care of their patients?
2. What is the current/future need for telesurgery services (see Section 2, "Needs Assessment")? Is service to remote sites or remote CBOCs currently problematic?
3. How should the services be constructed (see Section 3, "Clinical Specifications," and also Section 4, "Technical Specifications")?
4. What components are necessary to both make the system operational and also sustain it (see Section 5, "Managing the Service")?
5. How can clinical effectiveness be monitored (see Section 6, "Quality and Outcomes Measures")?

Most of these sections are supplemented by the following:

1. Hotlinks to facilitate direct connection to such items as VHA directives and vendor Web sites.
2. Links and references to additional policies and surveys
3. A checklist to assess operational readiness
4. A glossary
5. Footnoted references.

For the reader's convenience, most sections of this toolkit have two parts: one devoted to store-and-forward systems and another devoted to real-time, interactive telesurgery.

Section 2: Needs Assessment

Defining the reasons for considering telesurgery services

As an initial step toward creating a useful telesurgery program, the Surgical Service Chief should designate a lead clinician for this activity. This individual is tasked with the following:

1. Identifying other specialty services within the system or network currently using telehealth.
2. Identifying the system or network steering group, if one exists [and creating one if not].
3. Approaching the Telehealth Steering Group Chair in order to express specific interest in telesurgery services.

In exploring creation of a telesurgery program, the Steering Group should determine why telesurgery is being considered as an alternative to face-to-face visits. Typically, VHA telesurgery programs have begun in systems/networks with geographically distant sites of care, with defined unmet needs with respect to surgical specialty care. Other situations where telesurgery consultation has value include areas where recruiting staff at the desired level proves difficult, or where travel time for current VHA clinicians precludes maximum efficiency. Regardless of the primary motivation for telesurgery (or telehealth in general), both patients and clinicians can (and should) benefit. Meeting the true needs of both patients and clinicians should be viewed as a key goal.

Performing the needs assessment

The Surgical Service's telesurgery lead should interact with the Steering Group to conduct the needs assessment and identify existing resources. Additionally, identifying key individuals (patients and clinicians) who can serve as champions for the concept of telesurgery consultation, as well as serving as informational resources, can be of great value.

Assessing patient needs:

Defining which patients might most benefit from telesurgery consultation represents a key step in focusing the effort. For example,

1. Which patients currently receiving surgical follow-up or treatment at existing VHA facilities might instead be served by telesurgery consultation? Those who must travel considerable geographic distance for care represent key telesurgery clients.
2. Which patients not currently receiving surgical care might benefit from provision of telesurgical consultation?
3. Which eligible patients currently outside the VHA system might avail themselves of VHA services if telehealth services such as telesurgery consultation were available?

Addressing the first question might begin by 1) Requesting a report from the VHA's Austin database on patients that are seen in surgical clinics at the parent VA facility, and then identifying those patients whose primary care physicians

practice at a remote CBOC or VAMC. Such patients might benefit from having their care integrated into their primary care physician's setting through telesurgery programs. 2) Examining wait times for new consultations and appointments. This information can be easily obtained by clinic staff. Identifying patients, through the local Planning and Development office the proportion of existing (and potential), residing in zip code areas remote from the main point of secondary/tertiary care. Other means of assessing potential patient need are certainly encouraged.

Using VHA databases, one can identify which potential satellite sites (e.g. CBOC's and VET Centers) are likely to have sufficient patient numbers to justify developing telesurgery consultation services.

Assessing patient needs in this way gives the Steering Committee quantitative data concerning patients that might benefit from telesurgery services. This is key in determining the "who", "where", and "why" in establishing telesurgery services.

Assessing clinician needs:
The needs of both referring and consulting clinicians must also be considered. Identifying areas of mutual benefit should be viewed as a key deliverable. *Store-and-forward* interactions can guide triage decisions, guide treatment deliverable at a distant site, or ensure proper follow-up of previously treated patients. *Real-time* interactions are usually necessary for activities such as decision for surgery, preoperative clearance, and/or informed consent. Each interaction mode has its advantages, and the decision to use one or both, depends on the clinical situation, and the targeted function. Patient and practitioner satisfaction can be high with each.

Store-and-forward telesurgery can be convenient when a treatment decision hinges on a particular imaging finding (e.g. CT, MRI, etc.) or the appearance of a superficial area which can be digitally photographed. The background and images can then be transmitted to a consultant for a decision. Combining CPRS with imaging tools (e.g. Stentor) makes this type of interaction a fairly straightforward use of existing VHA technology. Use of a specific telesurgery consult template facilitates logistics. Benefits: When patients reside at considerable distance from the site of specialty service, or if it is not provided at the CBOC they frequent, this can be a very efficient means of capturing expert opinion for a triage or treatment planning decision. The surgical consultant can review at his/her convenience digital photos or images that were previously uploaded. This mode of interaction permits the consultant more time for reflection and thought than real-time interactions. Additionally, this mode tends to facilitate educational exchange between clinicians (e.g. transmission of references, etc.). No scheduling is involved, so a referring clinic can obtain and send both text & uploaded images as they acquire them. For superficial lesions or postoperative wounds, high quality images may be obtained from a handheld digital camera with minimal expense. Technically, a high bandwidth connection

is not required for transmission of most digital camera images. Challenges: This approach depends critically on the quality of training of the staff who obtain images and history sent from the referring clinic. Moreover, the patient is usually not available to immediately benefit from any recommendations but must be contacted by the referring clinic staff or rescheduled for a new visit for any additional diagnostic tests or treatment.

Real-time interactive telesurgery is quite comparable to a face-to-face session. With this interaction, a referring clinician or nurse can relate history and key exams at the onset of the real-time session, thus optimizing the time spent for direct patient-specialist interaction. Benefits: This modality allows the surgeon greater control over which areas to be examined/re-examined and also allows back-and forth exchange with the patient. The patient also benefits from immediate recommendations at the end of the session. Challenges: This approach is essentially the same as doing a face-to-face clinic — the interaction must be scheduled for all parties involved, and the time required for the consultation is lost if the patient does not show. Time spent is equivalent to time that the surgeon would have spent seeing a face-to-face patient. Additionally, the time spent by the practitioner with the patient during the interactive session must be considered. This modality, therefore, may require the surgical service to allot a certain amount of (Full Time Employee) FTE staff funding (i.e. clinician specialists and support) specifically to telesurgery. The referring clinic must also set aside some space and clinician time for telesurgery videoconferencing. The nature of real-time interactive telesurgery requires a reasonably high-bandwidth connection. Investment for videoconferencing equipment and cameras must be made for each clinic site. In many cases, however, the basic telecommunications connections and equipment already exist for administrative purposes or other telehealth programs.

Section 3. Clinical Services Specifications

Who will receive telesurgery health services?
For optimal success, telesurgery consultation should be utilized for selected conditions/circumstances lending themselves to non-urgent decision-making and treatment. The nature of the interaction usually precludes immediate surgical treatment. Staffing and resource availability are key considerations. The ability of the Surgical Service to handle telesurgery consult volume (either store-and-forward or scheduled real-time video-consultation), must also be considered.

General inclusion criteria for telesurgery patients:

1. All patients eligible for surgical care in the VHA.
2. New and established patients (patients who have previously received surgical care).
3. Requests for diagnostic questions and/or management of existing conditions.

Site-specific criteria should be considered in designating CBOC's or other affiliated clinics/medical centers that will participate in the consult process.

General exclusion criteria for telesurgery patients:

1. Patients who do not give verbal informed consent to participate in the telesurgery process.
2. Patients with problematic mental illness likely to interfere with the telesurgery process.

Which telesurgery services will be offered:

Telesurgery services can be divided into two types:

A. *Consultation*. Typically, this is a single consult whereby the consultant provides a diagnosis and treatment plan to the referring clinician. It is the responsibility of the referring clinician to implement these recommendations. The consultant does not assume care of the patient.

B. *Ongoing Treatment*. The consultant clinician provides care beyond the level of supportive consultation and assumes care of the patient.

The model for telesurgery services almost exclusively entails the *consultation* type of service. The consultant surgeons will provide a diagnosis or presumptive diagnosis and a treatment plan intended for implementation by the referring clinician. Follow-up care for a patient who has had previous contact with a surgery clinic (i.e. an established patient) may also receive continuity care via the *consultation* mechanism, providing that the referring clinician remains responsible for implementing the recommendations.

The consultant surgeon may, additionally, request an in-person clinic visit. There are several reasons for requesting an in-person clinic, including uncertainty of the diagnosis, poor image quality, the need for a surgical intervention, and other reasons. In this case, the surgeon assumes *ongoing care* when the patient presents to clinic as would normally occur in a conventional clinic-based consult. Ongoing post-clinic visit care may be provided via the telesurgery consult mechanism, as described above, through either *consultation* or *ongoing treatment* services, as agreed upon by the referring and consultant clinician. In general, the *consultation* mode should be favored.

Where will telesurgery patients be treated?

The referring site, whether it be a store-and-forward or real-time interactive consult, will be the site of care, at least for the initial interaction. This would include any facility that is functioning as the referral site. Telesurgery patients that require an in-person clinic visit with a surgeon will be under the care of the referring clinician until that patient presents to clinic. Follow-up treatment can be arranged via clinic visits or telesurgery, as agreed upon by the patient, consultant, and referring clinician.

When will telesurgery patients be treated:
Store-and-forward modality. Consultant recommendations that result from a store-and-forward consult are the responsibility of the referring clinician, unless otherwise agreed upon by both parties. Store-and-forward consults should be reviewed in a timeframe that is defined and explicitly understood by both parties. The timeliness of treatment implementation by the referring clinician will be guided by the diagnosis and treatment plan offered by the consultant and cannot be uniformly proscribed. A mechanism should exist that alerts the consultant that a consult is pending and that alerts the referring clinician that a consult request has been answered. When using CPRS, the ”View Alert” system can fulfill this role. Interfacility consults should adopt the interfacility consult mechanism in CPRS that allows for use of the View Alert system. If consults are being conducted outside the CPRS medical record, some mechanism analogous to the View Alert system should be implemented.

Real-time interactive modality. Because of the real-time nature of this consult modality, the referring clinician and/or a telepresenter (e.g., Physician’s Assistant, NP, or RN) receives immediate feedback on a diagnosis and treatment plan. While this allows for simultaneous implementation of the consultant’s recommendations, the timing of implementation will still be guided by the diagnosis and treatment plan offered by the consultant surgeon and whether the referring clinician is also the "telepresenter."

Who will treat the telesurgery patients?
Store-and-forward
Originating site referring clinicians
1. Any clinician with privileges to refer patients to a Surgical Consult Service. This includes physicians, physician assistants, and nurse practitioners.

Distant site consulting surgical specialists
1. Staff surgeons
2. Appropriately supervised surgical residents

Real-time interactive
Originating Site Referring Clinicians
1. Any clinician with privileges to refer patients to a Surgical Consult Service. This includes physicians, physician assistants, and nurse practitioners.
2. Real-time interactive consults require a "telepresenter." A telepresenter may or may not be the individual that initiates the consult. The telepresenter is responsible for the using the video-conferencing technology, preparing information for the session, and preparing the patient for the session.

Distant Site Consulting Surgical Specialists
1. Staff surgeons
2. Appropriately supervised surgical residents

For both consult modalities, responsibility for implementing treatment recommendations (e.g., wound care, biopsies, etc.) by either the referring clinicians or the surgeons should be discussed prior to initiating the telesurgery consult system. Since there is regional variation among sites regarding treatment implementation, this should be left to the discretion of the referring and consultant clinicians.

Section 4: Technical Specifications

Inventory of existing equipment

After deciding which sites will participate in the telesurgery program and which mode of delivery (store-and-forward and/or real-time) will be used, attention should be turned to the equipment and technology portion of telesurgery. Some of the intended sites may already have existing equipment used for other programs that can be used or added to and very little new equipment may be needed. Many CBOC's already have video conferencing equipment used for administrative meetings, etc. that could be available for clinical use at certain periods of time. Before purchasing new equipment, a decision should be made on which peripherals will be used. This may determine the need for more equipment or a different video conferencing system. The equipment should be in a room that meets the privacy and security needs of patients in a clinical setting. These issues should be addressed long before the clinic commences.

Purchasing the equipment

If a telehealth steering committee has been formed in your medical center or VISN, they can help with contacts at the local or VISN level to help procure the equipment. There is usually a network administrator in IT at the VISN level who knows which sites have what equipment. This person will be able to answer questions on availability of equipment or give contact information for the Informatics staff in the medical centers and CBOC's. The dermatologist should be included in the decision of what equipment to purchase in case they have a preference.

Informatics support

It is imperative that the VISN and local Information Technology Service (ITS) is involved in planning any new telesurgery clinics, especially real-time clinics, from the onset. The VISN and local CIO's support is critical to the success of telehealth initiatives. Developing a working relationship with such staff is mandatory. They can help with questions and training with VISTA Imaging for store-and-forward. They will know current problems, future plans for the system, the bandwidth available, and will save the clinic coordinators many headaches. Bandwidth availability is very important particularly for real-time telesurgery clinics. If the system is competing for bandwidth with data traffic on the network, there will be disruption in video and audio and it will be hard to communicate effectively. The IT personnel should be available by phone at all times for

technical problems. These are real clinics with real patients and if end users are not able to rely upon the technology, they will cease use of it and return to in-person clinics.

Information Security
The facility ISO should be involved in the planning stages to make sure the proposed telesurgery program is HIPPA-compliant. This is also the contact for staff to receive access to other facilities if needed for a telesurgery clinic.

Modes of Delivery:
A. Store-and-forward modality A complete guide to digital photography is beyond the scope of this toolkit. Cameras differ in their configuration and the camera manual will be the best guide to the user. Practice with using the camera is also very important in photography and the user should learn to operate and feel comfortable with the camera. There are many non-VA commercial online resources to learn all about digital photography.

Camera (general):

1) High-resolution photographic images should be taken with a digital camera having a minimum resolution of 1024 x 768 pixels. Much higher resolution point-and-shoot digital cameras can now be purchased at an affordable price, but for surgical problems, these resolutions are often not necessary, and are associated with longer transfer times and increased storage requirements. In general, a camera with at least 3 megapixels should offer enough flexibility in resolution to meet most clinical needs. Other key features of the camera should include: Ease of operation
2) Macro mode allowing optical (not just digital) close-up view of wound, incision, or skin lesion
3) Control of the flash or no flash, and
4) Easy, adequate-capacity image storage (e.g., flash card, other).

Imaging Standards and Quality Assurance:
Comprehensive pre-determined photographic standards are not possible due to features such as skin tone, lesion location, lesion size, and the nature of photography itself. Nonetheless, some attempt at accurately reproducing the features of the imaged skin lesion must be attempted and accurate representation of the colors present is important. Variables that can affect the final image include features and settings of the camera, the ambient light source or camera's light source, the software used for image adjusting and viewing, and the monitor used for viewing. The single most important factor for image quality assurance is to have a mechanism to immediately review images after they are obtained. This can include a built-in screen on the camera itself, however immediately uploading to a laptop or desktop computer is preferable. The most

common event that negatively impacts image quality is lighting. The light source, particularly the camera's own light source often requires adjustments that can only be determined after reviewing the image. It is frequently necessary to adjust the light source and retake images for optimal quality.

As noted, color matching is another key consideration. Consultants may be misled if the image they are reviewing does not accurately represent the color spectrum present in the actual target. Most digital imaging software packages (such as Adobe Photoshop) allow for color corrections. A tool from traditional photography, a color chart such as the Macbeth ColorChecker Card, allows the imager to make software adjustments to the image that result in better color matching than the "stock" image directly obtained by the camera. Additionally, making sure that the screen resolution and color depth of the viewing monitor is set at adequately high levels to incorporate all the digital information that is contained in the image is important. Finally, many digital cameras are highly automated. However, should some features be adjustable, those settings should be determined and optimized prior to imaging. The general principles of color matching and a mechanism for quality control are universal features that must be considered.

Image Review Monitors:
If the digital camera does not have a built-in screen to review image quality, it is desirable to have a computer that is available to quickly review the images at the referring clinic while the patient is still present. The computer used by the consultant should have a monitor sufficient for reviewing images, typically 1024 x 768 pixels and 24 bit color. Of course, the computers should also be fully capable of supporting CPRS and Vista Imaging.

Uploading images to VistA Imaging server:
If the computer is a laptop with a PCMIA slot and the camera uses a standard PC card, transfer of images from the camera to the computer is relatively straightforward. Many cameras can also be directly connected to computers. However, depending on the type of memory media (e.g., flash card) used by the camera, it may be desirable to purchase a separate card reader that allows the card to be accessed by the computer. The advantage of these readers is that clinic staff can continue to use the camera while previous photos are simultaneously processed.

Peripherals:
If one obtains a good quality camera with macro mode ability, extra peripherals are seldom necessary. However, for some uses, such as diagnosis of dermal lesions, some specialists like the ability to evaluate lesions under polarizing light as well as under microscopy. However, the use of these peripherals increases the sophistication of training as well as the time required to image.

Room conditions:

Good lighting is important to illuminate the skin, but also since some digital cameras depend critically on adequate lighting in order to auto-focus. Natural lighting from indirect sunlight is usually best. Fluorescent or incandescent room lighting can also be used as long as the skin is well-illuminated and the coloration is checked. Many digital cameras have the ability to adjust for different types of light, and this function can be optimized and agreed upon ahead of time. A background of non-reflecting blue cloth (3' x 6') as well as smaller cloths (such as a blue surgical towel) for smaller areas on extremities are often useful in creating a uniform appearance as well as minimizing unwanted reflections and distracting backgrounds.

Labeling:
Photos can be labeled with the patient's name; this may be required, depending on the site. Often these come with a ruler on them as well that aids the specialist in evaluating the wound or lesion. These can be purchased from commercial vendors or designed locally and printed out (see appendix for example).

B. Real-time modality If a real-time clinic is to be implemented, video conferencing equipment such as that used for videoconferences between facilities should be acquired. The most important criteria are:

1. The video systems are compatible
2. They use the same video application protocols
3. There is sufficient bandwidth for the application

For diagnostic purposes. equipment utilized needs to provide high-resolution. Image quality is a function of refresh rate and resolution. At high bandwidths (512 kbps up to 1.922Mbps), these units can deliver TV quality, 60 fields video, for an outstanding video image and complete motion capture. Many CBOC's and most VA medical centers are equipped with T-1 lines (1.544 Mbps) for their video conferencing equipment over IP and this will provide the resolution needed. There are several videoconferencing equipment manufacturers with equipment currently in use in VHA facilities. The video conferencing unit does not include monitors, cables, installation, warranty, training, etc necessary to begin. The unit must be set appropriately for the bandwidth available. The local Informatics staff should be included on training when the unit is installed. You may wish to visit the Web sites of some of the companies manufacturing this equipment to get more information.

Peripheral Devices for real-time telesurgery consultations:
There are several peripheral devices and cameras available for use. The consulting surgeon should have input with respect to which of these devices they would like to use. There is no need to have all of these if the clinician specialist does not want to them. Make sure you order the necessary equipment to hook the peripherals to the video conferencing equipment. Your Informatics staff and the vendor can help with these decisions. You may want to think about involving your Biomedical Engineering department to help take care of your equipment.

General examination video camera:
Most real-time examinations will be performed using the regular room camera installed in the videoconferencing unit and a separate general examination camera (with x50 lens) for closer viewing. A good general examination camera combines power zoom, auto focus, freeze frame, and electronic image polarization in one camera. The general exam camera has a freeze-frame function that allows the consultant to study a selected area when it is difficult to hold the camera perfectly still. A tripod can also be used with this camera, but is not essential. A general examination camera costs approximately $6000.

Dermatoscope:
For detailed visualization of non-ulcerated dermatologic lesions, another camera available is a dermatoscope. It connects to the general examination camera. This camera is good especially for pigmented lesions as it lies directly on the skin. A millimeter scale in the contact plate allows lesion measurement. It is manufactured by various vendors, and costs approximately $1300.

Microscope:
Some surgeons and dermatologists like the ability to use a microscope (which uses an attached video camera) to assist in diagnosis. It also connects to the analog camera and light source unit. This can also be obtained from the vendors and the cost is approximately $10,000. Before expending funds, be sure this peripheral will be used.

Light Source:
The analog camera and light source drive a wide variety of diagnostic scopes. The camera/light source is usually manufactured and/or sold by the camera manufacturer. and the cost is approximately $7000.

Furniture to outfit the examination room may also be bought through the camera vendors or separately through a 'furniture only' vendor.

Telecommunications bandwidth
Bandwidth is a term with dual meaning: it can be used to describe the speed at which information travels; or it can be used to describe the capacity to transfer information. In simple terms, bandwidth is the "pipe" along which all information (data/video/audio) necessary for telemedicine transfers from one location to the other. Having more bandwidth available, means more information can be transmitted across the circuit at any given time. Since the VHA uses the wide area network (WAN) for moving all types of digital data as well as video, there is competition for space on the network. This competition can lead to bursts of data traffic and loss of audio and/or video quality during a real-time clinic. It is preferred that the VHA WAN is used since it is already in place. If a site such as a Vet Center or CBOC is used and the WAN is not available, use of ISDN should be investigated. The VISN network administrator should be involved in the

discussions before plans are finalized and equipment purchased. Equipment varies depending on ISDN or WAN capability.

Network Based LAN/WAN Videoconferencing:
With network based videoconferencing, key considerations include bandwidth and QOS (Quality of Service). A higher bandwidth gives you better video performance. However, QOS typically suffers if you do not have control over the bandwidth (data traffic interference). The current standard for this type of videoconferencing is named H.323.

ISDN Videoconferencing:
ISDN based video conferencing systems use digital phone lines to communicate. Each ISDN line has a combined bandwidth of 128k. Typical ISDN videoconferencing systems operate at 128k (1 ISDN Line) or 384k (3 ISDN lines). Real-time video transmission at 30 frames per second requires 3 ISDN lines (384k). The current standard for this type of videoconferencing is named H.320.

Contingency plan
A backup plan for system downtime should be in place in case of equipment failure in a real-time clinic. It will eventually happen and you need to be prepared especially if there are problems with equipment at a distant site such as a CBOC. If the distant site can be reached by phone, the consultation can possibly be completed and the needs addressed on the current patient. If the videoconferencing network is available and only CPRS is down, the consultant can often still continue with the clinic (and enter CPRS notes at a later time). One should have paper progress notes or consult sheets on hand for the specialist to complete for later reference when CPRS entry again becomes possible.

Lighting and room conditions for telesurgical consultation: The clinical setting, lighting, and positioning of the cameras at the originating and distant sites are important for optimal communication.

Clinical setting:
For patients, it is important to create the impression that he or she is actually present in the consultant's private exam room. An exam table should be provided where the patient can be examined by the telepresenter. The room should be large enough for the equipment, but not so large that the patient feels uncomfortable with the encounter. Ideally, the room should be used strictly for telehealth activities. Large multipurpose rooms usually do not convey the optimal clinical tone and are usually not suitable for confidential patient care encounters. Privacy is critical and neither the exam room nor consultant room should be accessible visually or audibly to walk-by traffic. For both privacy and control of lighting, it is best to place the telehealth clinic in a room without a window. The room should not be accessible to walk-in interruption. The clinician will need

access to CPRS in order to answer the consult or enter a progress note as well as review medications, labs, etc.

Lighting:
Florescent overhead lighting is usually standard in most exam rooms. This can cast a shadow on the faces of all parties. A source of light at eye level in front of the participants provides a warmer, more even tone. "Cool lighting" is better for illumination than "warm lighting." A window in the room will make the light difficult to adjust.

Sound:
Microphones are extremely sensitive and pick up background noise very easily. Do not place a microphone close to a phone, on the desk near where papers may be shuffled, or near the keyboard as noise from all these things is distracting especially if the patient is hard of hearing. A room with no windows will cut down on outside noise and increase the level of privacy. Adequate soundproofing of the room with ceiling tiles, carpet (at least on the clinician's end), and a heavy door will also help.

Monitors:
It is helpful to have two monitors on both ends of the video link: a high-resolution monitor and a large screen television on the consultant end and two regular large televisions on the patient end. By placing two televisions on the patient end, the telepresenter and patient will know if they are in the camera's range of view. The consulting specialist should guide positioning to ensure that both the telepresenter and the patient are in the center of the picture. This can be achieved with a regular television. The high-resolution monitor is used for diagnosing.

Camera Placement:
The room camera is usually either placed on top of or beside one of the monitors. The patient and consultant will typically sit about six feet away from the monitor, with their head even with the monitor. The idea is to have the patient and consultant look as much as possible as though they are looking at each other. It is usually best to have the image of the consultant from the desktop up and naturally sized. The image should not be zoomed in too close or too far away. While the patient and consultant are talking, the image of the patient should also be of natural size.

For further information, the VHA's Telehealth Web site announces future satellite broadcasts on telehealth. An existing 20-minute video entitled VHA Telemedicine's "Steps to Success" may be useful for setting up your telesurgery consultation program.

Section 5: Management of the Service
Clinical and business management
Following identification of patients who will be treated by the service, along with the clinical and technological specifications, the steering group should assure that the service is properly managed clinically and has a viable business case that is sustainable long-term. The steering group needs to continue to manage the overall strategy and design of the service. Ideally the project will have access to a telehealth coordinator who will help with the operational aspects of implementing the service. It is vital that the project has an identified clinical champion who will take ongoing responsibility for the service.

Credentialing and privileging
The Joint Commission on Accreditation of Healthcare Organizations (JCAHO) addresses "Telemedicine Credentialing and Privileging" in Standards MS.5.16-MS.5.16.1. Additionally, JCAHO has drafted standards changes, to become effective January 1, 2004, which can be found through the JCAHO Web site http://www.jcaho.org/

For VHA telehealth, specific policies and procedures are addressed in VHA Directives that can be accessed at:
http://www.va.gov/telehealth/

Credentialing and Privileging of telemedicine clinicians is explicitly addressed in:
1. VHA Directive 2001-055 “Credentialing and Privileging of Telemedicine and Telehealth Services Provided in Hospitals and Clinics”
http://www.va.gov/publ/direc/health/direct/12001055.pdf
2. VHA Directive 2002-042 “The Credentialing and Privileging of VHA Health Care Providers Remotely Delivering Health Care to Patients at Home, in VET Centers, and in Non-Health Care Settings via Telemedicine and/or Telehealth.”
http://www.va.gov/publ/direc/health/direct/12002042.pdf

These VHA requirements for credentialing and privileging necessitate that the clinicians establishing the telesurgery service make a distinction between whether they are providing ‘consultation’ or ‘care’ to the patient at the originating site. The originating site is where the patient is physically situated at the time images are acquired. In the case of real-time telesurgical interactions, there is usually a staff member in the room while the patient is linked to the practitioner at the distant site from whom he/she is receiving care/consultation. In many cases, the surgical specialist will choose to serve as a consultant, rather than assume care for the patient, particularly if diagnostic imaging or cytopathologic diagnosis has yet to be completed. In such instances, the referring physician retains the responsibility of implementing the specialist's recommendations (e.g. simple wound care, etc.).

Training and competencies
In addition to credentialing and privileging, competency with the equipment and the procedure should be verified for each clinician or staff member prior to his/her participation in telesurgery visits.

It may be desirable at each referring site to designate one person to serve as photographer or video operator/presenter, and one as a back-up. This should preferably be a staff person, such as a nurse or clerical support member, who is not primarily responsible for the patient's care. This minimizes the burden on clinicians, and fosters expertise and consistency in photography. Staff who have a personal interest in photography or telemedia are ideal candidates.

Training needs will vary depending on the modality of telesurgical consultation chosen, although the principles of patient confidentiality and HIPAA regulations permeate all types of telehealth:

Store-and-forward telesurgery requires the following training:

For referring clinicians:

- Suitable training with respect to the type of information to gather from the patient. History of the wound or lesion, tenderness, etc., is often key for generating an optimally useful consult. Detailed patient history can be gathered by having the patient fill out a form from the specialist consultant. This can be photographed and/or incorporated into the consult as another image.

For photographers:

- Training on how to use the digital camera and its accessories in both regional and macro modes under proper lighting and backgrounds. There are no standards yet, but a bland blue background such as provided by a surgical towel is often used. A calibration of color is periodically necessary. Making color corrections to images may also be considered a part of training (see Section 4).
- Training on how to obtain the proper series of image perspectives and magnifications for localized, regional, and generalized skin diseases, rashes, and/or wounds, scars and incisions. Specific requirements may vary, but the surgical specialist who will be interpreting images should be consulted.
- Training on how to identify patients in the image with a label or by other means.

For support staff (e.g. the photographer, the photographer's assistant, or the health technician):

- Training on how to upload images with Vista Imaging or other image transmission software.

- Training on how to enter consults
- Training on how to confidentially archive and erase the digital camera's memory once the consult request is complete.

Real-time interactive teledermatology requires the following training:

- How to operate the equipment
- Logistics. Scheduling, security, support, and coding are key activities for which training must be provided.
- Training on effectively employing telesurgical consultation. Clinical protocols, confidentiality, informed consent, ethical standards, protocols and etiquette are all key topics.
- Training on the actual conduct of the visit (e.g. telehealth interviewing techniques and tips to improve communication)

Examples of ways to document competency include:

- Having the clinician demonstrate that he/she can use the equipment to someone experienced with telehealth
- Having the clinician read this toolkit
- Having the clinician view any of the VHA Employee Educational System (EES) satellite broadcasts
- Having the clinician complete a similar or comparable training experience

Clinical protocols, policies and procedures

There are no absolute VHA diagnostic specific clinical protocols for delivering telesurgery. However, each steering committee is encouraged to develop their individualized clinical protocols based upon the anticipated treatments offered and the resources available.

A collection of useful protocols and guidelines for both store-and-forward and real-time telesurgery can be found at the American Telemedicine Association's Web site, in the teledermatology section of www.atmeda.org/ICOT/icot.htm.

Informed Consent

There are two types of informed consent: verbal informed consent and signature/written informed consent.

Currently there are two VHA documents providing guidance on informed consent for VHA telehealth, including teledermatology. These two documents are VHA Handbook 1004.1 'VHA Informed Consent for Clinical Treatments and Procedures' at: http://www.va.gov/publ/direc/health/handbook/1004-1hk1-29-

03.pdf (For guidance specific to VHA telemedicine/telehealth, see Part G of the Handbook's Section 9 entitled, 'Consent in Special Situations') and VHA Information Letter IL 10-2002-042 'The Credentialing and Privileging of VHA Health Care Providers Remotely Delivering Health Care to Patients at Home, in Vet Centers, and in Non-health Care Settings via Telemedicine and/or Telehealth' at http://www.va.gov/publ/direc/health/direct/12002042.pdf (For C&P guidance, see Attachment A entitled, 'Interim Veterans Health Administration (VHA) Guidance when using Telehealth to Deliver Health Care Services into Home and Vet Center Settings to Accompany Provider Credentialing and Privileging Requirements')

For VHA Telehealth in general, and VHA Telesurgery (either real-time or store-and-forward) specifically, these two documents indicate:

1. Informed consent is obtained after providing the patient with a full explanation of
    i. the risks and benefits of telesurgery
    ii. all alternatives for obtaining surgical care through an in-person visit at the nearest VA dermatology clinic or in the community, if available
    iii. the patient's right of refusal, at any time, for any teledermatology treatment

2. Informed consent need only be obtained at the commencement of each treatment and/or care program and should be documented in the clinical record. Informed consent is not required for each individual episode of care within the program of treatment and/or care.

3. Verbal informed consent is the minimum requirement for all VHA telehealth programs, according to current standard of practice.

4. Signature informed consent must be obtained for either of these two scenarios:
    a. Anything beyond a visit conducted at VAMC or CBOC. Delivery of any level or modality of telesurgery service to any public or private non-health care setting (e.g. patient's home, Vet Center, others) outside a VA Medical Center or Community-Based Outpatient Clinic (CBOC).
    b. Special instances within a VAMC or CBOC, including delivery of any level or modality of telesurgery service as described in 7c(2)(a) of 'VHA Informed Consent for Clinical Treatments and Procedures.' Included are all those services that:
        i. Involve the use of sedation
        ii. Involve the use of anesthesia or narcotic analgesia
        iii. Can be reasonably expected to produce significant discomfort to the patient

iv. Can be reasonably considered to have a significant risk of complication or morbidity
v. Require injections of any substance into a joint space or body cavity, including any non-vascular space
vi. Involve testing for human immunodeficiency virus (HIV);

Or services described in Appendix A. of 'VHA Informed Consent for Clinical Treatments and Procedures' as:

vii. Surgical or invasive procedures, including but not limited to:
    1. Acupuncture;
    2. Anesthesia (except for low-risk local anesthesia);
    3. Aspiration of body fluids through the skin (e.g., arthrocentesis, bone marrow aspiration, lumbar puncture, paracentesis, thoracentesis);
    4. Biopsy (e.g., breast, liver, muscle, kidney, genitourinary, prostate, bladder, skin);
    5. Cardiac procedures (e.g., cardiac catheterization, cardiac pacemaker electrode insertion, electrical cardioversion);
    6. Central vascular access device insertion (e.g., arterial line, Swan-Ganz catheter, percutaneous intravascular catheter (PIC) line, Hickman catheter);
    7. Electrocautery
    8. Endoscopy (e.g., bronchoscopy, colonoscopy, cystoscopy, laparoscopy);
    9. Interventional radiology procedures (e.g., angiography);
    10. Laser therapy;
    11. Oral surgical procedures (including gingival biopsy);
    12. Sterilization of reproductive capacity;
    13. Thoracotomy;
    14. Tracheostomy; and
    15. Transjugular intrahepatic portal stent (TIPS)
viii. Blood product transfusion
ix. Dialysis (hemodialysis or peritoneal)
x. Electroconvulsive therapy
xi. Genetic testing.
xii. Hazardous drugs (e.g., cancer chemotherapy, disulfiram, methadone for narcotic dependence, naltrexone).
xiii. Photochemotherapy in combination with psoralens or other topical agents. Radiographic procedures to include:
    1. Radiographic contrast agents in high-risk patients (e.g., those with prior allergic reactions, renal failure or other risk factors) for Computerized Axial Tomography CAT scans, cisternograms, intravenous pyelograms and other procedures; and
xiv. Ultrasound therapy (e.g., lithotripsy)

xv. Home telehealth

5. Signature informed consent must include the elements that appear in section 9(6)(g) of 'VHA Informed Consent for Clinical Treatments and Procedures'

While more specific VHA guidance is likely forthcoming, current directives and/or standard practice are outlined as above.

Special circumstances requiring signature consent:
In addition to home telehealth, there are two instances for which a signature consent must be obtained in the course of telesurgery interventions.

1. If, as a result of a telesurgery consultation, a patient's picture and/or voice recording is being disclosed to an entity covered by Department of Veterans Affairs (VA) Form 10-3203, Consent for Use of a Picture or Voice: http://vaww.va.gov/vaforms/medical/pdf/10-3203.pdf then this document must be signed by the patient. This document is not a document of informed consent. Its function is to serve as a release of picture and/or voice information.

2. In the event that the telehealth delivery episode is part of a research study, signature (written) informed consent must be obtained per VHA Research Guidelines.

Coding and workload credit
A detailed description of the VHA coding for telehealth, and specific coding for both store-and-forward and real-time telesurgery will be available on the VHA Telehealth Web site at http://vaww.va.gov/telehealth. In brief, DSS secondary 'credit pair' codes 690, 692, and 693 are used for real-time and, beginning FY06, DSS secondary 'credit pair' codes 694, 695 and 696 will be used for store-and-forward telesurgery clinics when paired with the DSS primary code that would be used if the clinic was conducted face-to-face.

Guidelines for conducting the real-time telesurgery consultation
Verbal Communication:
Verbal communication becomes more deliberate in telehealth. In normal conversation, there is a natural give-and-take, with either party cutting in, interrupting the other, completing the other's sentences, and so forth. This occurs naturally and without much thought. Due to the slight delay in transmission time and other technical limitations, this fluidity is limited in telehealth. Patients comment that the flow of conversation is similar to that seen on television when someone is speaking to astronauts in space. The flow of conversation becomes more deliberate, more punctuated, more formal. Both clinician and patient usually quickly learn to speak more clearly and more slowly. Both parties learn to speak in complete thoughts, then pause and listen. It is not effective to attempt to talk over one another. This more telegraphic style of

conversing actually can lead to more orderly communication, but it can impair the expression of emotions.

Non-verbal Communication:
It is important that non-verbal gestures not be too rapid. If a gesture's speed exceeds the system's ability to convey it, the patient sees only an odd flicker. Also, care must be taken to make hand gestures at mid-chest level or above, as gestures at the more customary lap level are out of the field of view of the camera. It is sometimes helpful for non-verbal gestures to be more broad than usual. For example, when in person, one might communicate bewilderment by very slightly leaning back and tilting one's head. In telehealth, it is more effective to arch far back in the chair and actually scratch one's scalp in confusion. These grand, dramatic gestures may seem unnatural or even insincere at first, but they can be far more effective than more subtle gestures.

Casual Introductory Conversation:
An introduction of the surgical specialist and of the patient is important. "Small talk" is a powerful tool of engagement in telehealth. A patient in a teleclinic may doubt whether the clinician can understand them or their world from where the clinician sits. Demonstrating an awareness of local events and geography can let the patient know that the clinician takes an interest in his or her world.

Clothing: Clothing choices are also a consideration. It is often helpful to wear clothing without patterns. A striped shirt, for example, can create interference patterns on the video image. Stark white clothing such as a lab coat can cause problems in balancing the contrast. When wearing clothing that is too bright, the clinician's face disappears into darkness. Patients that come to clinic wearing a hat can be asked to remove it, as the brim of a hat casts the patient's face into shadow from overhead lights. When the surgical specialist is ready to conduct remote exam of the patient, they may ask that the patient remove clothing. The patient should be given privacy when changing by directing the camera away from the patient or by allowing the patient to move to another part of the examining room.

Camera manipulation:
The telesurgery consultation will usually begin with the general videoconferencing camera while the patient and surgeon are speaking but, for the examination, the surgeon can instruct the presenter to switch to the general exam camera that allows close-up views of the patient's wound or lesion. Following the exam, revert to the normal videoconferencing camera as the specialist discusses his or her findings and recommendations with the patient.

The business case for telesurgery
Put simply, the business case is constructed from the numbers of patients that need to be treated and the costs of providing this care via telesurgery as compared to other ways of doing so. Given the current demand for surgical

services in VHA, and the mandate to improve access to services, especially at geographically remote sites, it is likely that the need for telesurgery will continue. With the ever-diminishing costs of telehealth equipment and telecommunications bandwidth, telehealth is an increasingly attractive solution.

Providing a real-time telesurgery service to a remote location with very poor telecommunications infrastructure may be prohibitively expensive at present. If this modality is still preferred over store-and-forward telesurgery, the cost and effort may not warrant the cost. The steering group may consider partnering with other clinical services to co-share the equipment and thus prorate the cost. Dermatology is a natural partner service. In addition, telesurgery programs that involve service to/from rural locations may be entitled to funding, from non-VA organizations (e.g., USAC, www.rhc.universalservice.org).

Systematic reviews of cost effectiveness studies of telemedicine and telesurgery are rare, although recent data indicate that telesurgery provides an improvement in cost-effectiveness over traditional face-to-face surgical care in some settings (e.g. rural settings). Any true cost analysis must also include the time and cost associated with patient travel for service in the event telesurgery is not available, and the lost capitated revenue associated with "loss" of a patient who deems distance too great an obstacle to participate in VA programs. Overall, from the VA's financial perspective (not the patient's perspective), real-time telesurgery has yet to prove cost savings compared to usual care. As the telehealth and telesurgery work group determines methods for analyzing cost effectiveness within the VHA, they will be shared in future versions of the toolkit. However, for less expensive store-and-forward applications, cost savings have already been documented in some settings.

Section 6. Quality, Outcomes, and Evaluations

Four main areas of quality assurance and outcomes exist for telesurgery applications:

1. Diagnostic reliability and accuracy
2. Clinical outcomes
3. Clinician and patient satisfaction
4. Economic analyses

Two methods of obtaining this data should be considered:

1. Formal research studies
2. Ongoing quality assurance and economic assessments of functioning systems

Both formal research studies and ongoing quality assurance are important features of telehealth and telesurgery implementation. The foundation of telesurgery implementation should be built on formal research evaluations and continue through ongoing quality assurance programs.

1. Diagnostic reliability and accuracy.
A fairly large body of evidence exists that demonstrates that both store-and-forward and real-time telehealth applications can result in comparable diagnostic reliability and accuracy when compared to traditional clinic-based visits. Provided the consult procedures recommended in this Toolkit are followed, ongoing assessments of diagnostic reliability and accuracy need not be a major research focus. Direct feedback to surgical specialists and system-wide quality assurance programs can identify individual problem cases.

2. Clinical outcomes.
Clinical outcomes associated with telesurgery consultations are not as well studied as diagnostic outcomes. While comparable diagnostic outcomes should translate into comparable or improved clinical outcomes, this has not been definitively demonstrated to date. A comparison of clinical outcomes with traditional care requires a randomized clinical trial to assure a scientific, unbiased comparison. Some degree of clinical outcome assessment for functioning programs is recommended. Intermediate outcomes, such as time to diagnosis and treatment initiation can and should be surveyed. More definitive outcomes, such as time to resolution or significant improvement using disease-specific instruments could also be considered. More general quality assurance measures such as referring clinician compliance with the consultant's recommendations (e.g., need for biopsy) should also be considered.

3. Clinician and patient satisfaction.
Several reports in the medical literature exist that assess both clinician (referring and consultant) and patient satisfaction. Currently, a validated and reliable instrument to assess satisfaction among telesurgery participants does not exist. Developing such an instrument represents a future goal. Existing surveys are largely anecdotal assessments that rely on face validity – i.e., questions that the surveyors believe represent important domains. Nonetheless, these surveys can be useful to identify where problems may exist with functioning consult services. In the absence of a validated instrument, the surveys in Appendix 1 may be useful for satisfaction assessments. Because patients are removed from the technology with the store-and-forward consult modality, satisfaction assessments would not include patient assessments of the technology for this consult technique. Patients do interact with the technology when real-time interactive consult methods are used and patient perceptions of the technology are deemed relevant.

4. Economic Analyses.
Maintaining a viable telesurgery consult system depends on that system delivering either (1) cost savings or (2) cost-effectiveness. Cost savings imply that telesurgery consultation results in lower expenditures than traditional clinic-based care. Given the cost of the equipment, bandwidth, and personnel for real-time consultations, it must be shown that, telesurgery "buys" an improvement in

effectiveness (e.g., quicker time to diagnosis, better clinical outcomes) in a ratio that makes implementation of the strategy compelling. Current research on the economic implications are somewhat preliminary. To date, telesurgery has generally been shown to be the more costly alternative, and this is especially true for real-time interactive consultations. For teledermatology, a VA-based study has suggested that store-and-forward consultation, while more costly, is a cost-effective means of improving patients' access to care.

Glossary of terms: This is a partial listing of the most commonly used words or phrases to describe teledermatology activities, equipment or requirements.

Analog – Information electronic or otherwise that is created and transmitted as a continuous stream. Compare this to digital information generated by computers. Most Home Telehealth devices require the use of analog (direct dial, not through the PBX) not digital phone lines to operate.

Bandwidth – The capacity of an electronic transmission to transmit data per unit of time. The higher the bandwidth, the more data can be transmitted. Typically measured in kilobits (kb) or megabits per second (Mbps). Standard telephones are low bandwidth devices with cable TV being high bandwidth.

Baud rate – Is the ring rate or line power of the telephone line providing service into a given structure (home). Most Home Telehealth devices require a minimum baud rate of 14,000 to make successful video capture. However, the lower the Baud rate the likely disconnections will happen.

Component video – This type of video yields better image quality, higher lines of resolution, and better color.

Cost analysis – an accounting of the cost, irrespective of effectiveness or benefit, of an intervention(s).

Cost effectiveness analysis – an analysis that compares the incremental cost and incremental effectiveness of two or more interventions. The units of effectiveness are non-monetary measures.

DSS – Decision Support System provides information to support VHA business needs including: multi-pay or revenue determination; product and case-costing; resource utilization tracking; quality indicators; retrospective review of groups of cases for various quality protocols, reimbursement modeling and annual VA medical center and Veterans Integrated Services Network (VISN) budgeting. Additional general information about DSS is available to VHA staff only at http://vaww.dss.med.va.gov/ Additional DSS coding for real-time telehealth for FY 2005 is available to VHA staff only at http://vaww.dss.med.va.gov/DSS%20Documents/Other/FY05%20Telemedicine%20Instructions%20-%20Revised%2003-14-05.doc

Diagnostic Reliability – the repeatability or reproducibility of an examination finding or other diagnostic assessment. It is also known as agreement or precision. Two examiners that independently reach the same diagnosis are displaying diagnostic reliability.

Diagnostic Accuracy – describes whether the diagnosis offered is correct or incorrect. Typically, accuracy is evaluated using a gold standard test. The gold standard test is considered to be the best available test for classifying the presence or absence of disease.

Digital – Information coded in numerical values (bits). Digital data streams are less susceptible to interference like analog streams are. They can be more easily integrated with other data streams such as voice/video/data.

Digital camera – Captures images (still or motion) digitally and does not require analog to digital conversion before the image can be transmitted or stored in a computer. Most Home Telehealth equipment uses digital video cameras.

Distant Site – is the site where the provider providing the professional service is located. The DS may be one of 2 kinds, for purposes of DSS Workload coding. The first kind of DS is one where the DS shares the same STA3 (Station Number) as the OS e.g., a CBOC affiliated with a VAMC. The second type of DS is one where the DS and the OS have different STA3's (Station Numbers) e.g., a CBOC and a VAMC within the same VISN are not affiliated or where the DS and OS are in separate VISN's.

Economic Perspective – a consideration of the economic impact from a specific point of view, such as, total societal costs versus cost borne only by the health care system.

Encryption – A mathematical transposition of a file or data stream so that it cannot be deciphered at the receiving end without the proper key. Encryption is a security feature that assures only the appropriate parties participates in a video visit or data transfer.

Firewall – A computer connected both to the Internet and the local hospital network that prevents the passing of Internet traffic to the internal hospital network. Provides an added security layer.

Frame rate – Frames per second (fps) displayed on a video unit. A frame rate of 25-30 is considered full motion. Anything less than that is noticeably "jerky." Slower frame rates may be inadequate for some assessments such as gait and balance activities.

HL7 – Health Level 7. A standard interface between hospital information systems.

Internet – A loose gathering of thousands of computer networks forming an enormous worldwide area network.

Intranet – A "private Internet", or internal web that employs certain communication protocols used over the Internet. The Intranet may be linked to the public Internet through tightly managed gateways.

ISDN – Integrated Services Digital Network, a low-to-medium speed technology for digital telephone. Some Home Telehealth is ISDN based and can be used where available.

Local Area Network (LAN) – A computer network linking computers, printers, servers, and other equipment within a system. Can support audio, video, and data exchange.

Modem – Modulator/Demodulator. Enables transmission of digital data over standard analog phone lines and cable video systems.

Network – An assortment of electronic devices (computers, printers, scanners etc,) connected by wires or wireless for mutual exchange of digital information.

Originating Site – is the site where the patient is physically located at the time the telehealth service is provided. It is the site requesting consultation advice or care management support from a provider located at the distant site (DS). Each episode of care that is coded at an OS must be paired with the corresponding component of care that is coded at the DS. An OS site may be a CBOC, Vet Center or VAMC.

PBX – Private Branch Exchange (a.k.a. the switchboard) is a telephone system (i.e., switchboard, telephone lines, switching computer) within a VHA facility/campus that switches internal phone lines between VHA users, who actually share a certain number of external (outside) phone lines. Having a PBX saves money by reducing the number of lines required to connect all VHA facility telephones to the telephone company's central office.

Peripheral devices – Attachments to videoconferencing systems to augment their communications or medical capabilities. Examples include electronic stethoscopes, blood pressure cuffs, glucometers, and weight scales.

Pixel – A picture element/cell with specific color or brightness. The more pixels an image has, the more detail or resolution it can display.

POTS – Plain Old Telephone System. The analog, public-switched telephone network in common use throughout the world. Most Home Telehealth products rely on POTS.

Real-time interactive – a telehealth technique that uses video-conferencing technology to send and receive audio/video/data with little or no perceptible delay. Participants are separated only by space, not by time.

Resolution – The level of image detail that can be captured or displayed. Pictures are made up of dots of color called pixels, and there is a direct correlation between the number of pixels and the clarity of the digital images produced by a camera, displayed on a monitor, or printed by a printer. The more dots you have, the sharper the hard copy image will appear, particularly in larger (8"x10") prints. More dots (or pixels) also means a larger file, which has image file storage and transfer implications. For video monitors resolution is measured in pixels X lines X bit depth.

Store-and-forward – a telehealth technique that uses asynchronous still digital image/audio/video/data technology for communication, analogous to an e-mail system. Participants are separated by time and space.

Telehealth – The electronic provision of health care and information services for the direct benefit of patients and their families.

Thumbnails – Miniature pictures of images using very small, low-resolution data files. These download for display very quickly.

Transmission rate – Amount of information/unit of time that a technology such as POTS or digital ISDN phone line, satellite or wireless technology, or local area network can transmit.

Wide area network (WAN) – Wider in geographic scope than a LAN. Provides digital communications (voice/video/data) over switched or un-switched networks.

Contacts

Web sites for telehealth organizations have been provided as well as VHA contacts to help answer any questions that might arise in the process of planning for and implementing a VHA Telesurgery program.

Web sites:

VHA Telehealth
www.va.gov/telehealth
Telemedicine Information Exchange
http://tie.telemed.org

Organizations:

American Telemedicine Association
www.atmeda.org
American Telemedicine Service Providers
www.atsp.org

Personal contacts:

Adam Darkins, MD
Chief Consultant-Telehealth Strategic Healthcare Group
Department of Veterans Affairs
Washington DC
adam.darkins@va.gov

John Peters
Program Analyst-Telehealth Strategic Healthcare Group
Department of Veterans Affairs
Washington, DC
john.peters@va.gov

Scott Hundahl, MD, FACS, FSSO, FAHNS
Chief of Surgery, VA Northern California Health Care System
Professor of Clinical Surgery, U.C. Davis
Sacramento VA Medical Center
scott.hundahl@med.va.gov

Douglas E. Rosendale, DO FACOS
National Coordinator of Surgical Informatics
Douglas.Rosendale@med.va.gov

References

1. Bonvini RF, Caoduro L, Menafoglio A, Calanca L, von Segesser L, Gallino A. Telemedicine for cardiac surgery candidates. *Eur J Cardiothorac Surg.* Sep 2002;22(3):377-380.
2. Ganapathy K. Telemedicine and neurosciences in developing countries. *Surg Neurol.* Dec 2002;58(6):388-394.
3. Goldenberg D, Wenig BL. Telemedicine in otolaryngology. *Am J Otolaryngol.* Jan-Feb 2002;23(1):35-43.
4. Hall JC. The internet: from basics to telesurgery. *ANZ J Surg.* Jan 2002;72(1):35-39.
5. Jaatinen PT, Forsstrom J, Loula P. Teleconsultations: who uses them and how? *J Telemed Telecare.* 2002;8(6):319-324.
6. Kim YS. Telemedicine in the u.s.a. With focus on clinical applications and issues. *Yonsei Med J.* Oct 31 2004;45(5):761-775.
7. Lee S, Broderick TJ, Haynes J, Bagwell C, Doarn CR, Merrell RC. The role of low-bandwidth telemedicine in surgical prescreening. *J Pediatr Surg.* Sep 2003;38(9):1281-1283.
8. Marescaux J, Rubino F. Telesurgery, telementoring, virtual surgery, and telerobotics. *Curr Urol Rep.* Apr 2003;4(2):109-113.
9. Murdoch I, Bainbridge J, Taylor P, Smith L, Burns J, Rendall J. Postoperative evaluation of patients following ophthalmic surgery. *J Telemed Telecare.* 2000;6 Suppl 1:S84-86.
10. Sandberg WS, Ganous TJ, Steiner C. Setting a research agenda for perioperative systems design. *Semin Laparosc Surg.* Jun 2003;10(2):57-70.
11. Satava RM. Information age technologies for surgeons: overview. *World J Surg.* Nov 2001;25(11):1408-1411.
12. Schlag PM, Moesta KT, Rakovsky S, Graschew G. Telemedicine: the new must for surgery. *Arch Surg.* Nov 1999;134(11):1216-1221.
13. Ricci MA, Callas PW, Montgomery WL. The Vermont Telemedicine Project: initial implementation phases. *Telemed J.* Fall 1997;3(3):197-205.
14. Bowersox JC. Telepresence surgery. *Br J Surg.* Apr 1996;83(4):433-434.
15. Eadie LH, Seifalian AM, Davidson BR. Telemedicine in surgery. *Br J Surg.* Jun 2003;90(6):647-658.
16. Harris G, Berdusis K. Surgical telementoring across the Atlantic. *Telemed Today.* Jun-Jul 2000;8(3):23-24.
17. Allen D, Bowersox J, Jones GG. Telesurgery. Telepresence. Telementoring. Telerobotics. *Telemed Today.* May-Jun 1997;5(3):18-20, 25.
18. Mathias JM. Telepresence lets surgeons operate from remote site. *OR Manager.* Jun 1994;10(6):11.

Field Code Changed

Formatted: Italian (Italy)

Formatted: Italian (Italy)

Formatted: Italian (Italy)

19. Rodrigues Netto N, Jr., Mitre AI, Lima SV, et al. Telementoring between Brazil and the United States: initial experience. *J Endourol.* May 2003;17(4):217-220.
20. Sawyer MA, Lim RB, Wong SY, Cirangle PT, Birkmire-Peters D. Telementored laparoscopic cholecystectomy: a pilot study. *Stud Health Technol Inform.* 2000;70:302-308.
21. Ballantyne GH. Robotic surgery, telerobotic surgery, telepresence, and telementoring. Review of early clinical results. *Surg Endosc.* Oct 2002;16(10):1389-1402.
22. Rovetta A, Bejczy AK, Sala R. Telerobotic surgery: applications on human patients and training with virtual reality. *Stud Health Technol Inform.* 1997;39:508-517.
23. Satava RM, Simon IB. Teleoperation, telerobotics, and telepresence in surgery. *Endosc Surg Allied Technol.* Jun 1993;1(3):151-153.
24. Link RE, Schulam PG, Kavoussi LR. Telesurgery. Remote monitoring and assistance during laparoscopy. *Urol Clin North Am.* Feb 2001;28(1):177-188.
25. Gul YA, Wan AC, Darzi A. Use of telemedicine in undergraduate teaching of surgery. *J Telemed Telecare.* 1999;5(4):246-248.
26. Thompson JM, Ottensmeyer MP, Sheridan TB. Human factors in telesurgery: effects of time delay and asynchrony in video and control feedback with local manipulative assistance. *Telemed J.* Summer 1999;5(2):129-137.
27. Aucar JA, Doarn CR, Sargsyan A, Samuelson DA, Odonnell MJ, DeBakey ME. Use of the Internet for long-term clinical follow-up. *Telemed J.* Winter 1998;4(4):371-374.
28. Jones SM, Milroy C, Pickford MA. Telemedicine in acute plastic surgical trauma and burns. *Ann R Coll Surg Engl.* Jul 2004;86(4):239-242.
29. Kim HM, Lowery JC, Hamill JB, Wilkins EG. Accuracy of a web-based system for monitoring chronic wounds. *Telemed J E Health.* Summer 2003;9(2):129-140.
30. Minion DJ, Sprang R, Endean ED. A review of telemedicine in vascular surgery. *Minerva Chir.* Apr 2002;57(2):237-244.
31. Pap SA, Lach E, Upton J. Telemedicine in plastic surgery: E-consult the attending surgeon. *Plast Reconstr Surg.* Aug 2002;110(2):452-456.
32. Southern S, Ramakrishnan V. The digital second opinion. *Br J Plast Surg.* Dec 1998;51(8):649-650.
33. Sussmann H, Griebel H, Allescher HD, Egger K, Sandschin W, Horsch A. The teleconsultation service ENDOTEL. Implementation and first experiences. *Stud Health Technol Inform.* 2000;77:1117-1121.
34. Baldwin L, Clarke M, Hands L, Knott M, Jones R. The effect of telemedicine on consultation time. *J Telemed Telecare.* 2003;9 Suppl 1:S71-73.
35. Buurke JH, Kleissen RF, Nene A, et al. A feasibility study of remote consultation to determine suitability for surgery in stroke rehabilitation. *J Telemed Telecare.* 2004;10(2):108-112.

36. Dobson R. Meet Rudy, the world's first "robodoc". *Bmj.* Aug 28 2004;329(7464):474.
37. Sezeur A, Degramont A, Touboul E, Mosnier H. Teleconsultation before chemotherapy for recently operated on patients. *Am J Surg.* Jul 2001;182(1):49-51.
38. Dawson PJ, Johnson JG, Edgemon LJ, Brand CR, Hall E, Van Buskirk GF. Outpatient frozen sections by telepathology in a Veterans Administration medical center. *Hum Pathol.* Jul 2000;31(7):786-788.

Appendix 1
Telesurgery Patient Survey – Real-time Interactive Modality

1. I have confidence that the doctor can help me by using telesurgery consultation.

Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
□	□	□	□	□

2. Telesurgery was more convenient than having to travel to the clinic to see the doctor.

Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
□	□	□	□	□

3. I am concerned about my privacy when telesurgery is used.

Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
□	□	□	□	□

4. I felt comfortable with the telemedicine equipment used.

Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
□	□	□	□	□

5. There were technical problems that made it difficult for me to hear or see the doctor.

Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
□	□	□	□	□

6. I would rather have a telesurgery consult than go to see the doctor.

Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
□	□	□	□	□

7. Overall, I am satisfied with the telesurgery consult process.

Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
□	□	□	□	□

Telesurgery

Referring Clinician Survey – Real-time Interactive Modality

1. I get an educational benefit from the interaction.

Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
□	□	□	□	□

2. I prefer telesurgery consultation to traditional referrals.

Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
□	□	□	□	□

3. My patients benefit from the telesurgery consult process.

Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
□	□	□	□	□

4. I am comfortable with the telemedicine equipment used.

Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
□	□	□	□	□

5. There were technical problems that made it difficult for me to hear or see the consultant.

Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
□	□	□	□	□

6. Overall, I am satisfied with the telesurgery consult process.

Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
□	□	□	□	□

Telesurgery Consultant Survey – Real-time Interactive Modality

1. I am confident in my diagnoses and management plans when performing telesurgery consultations.

Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
□	□	□	□	□

2. Telesurgery is a more efficient use of the time I spend as a consultant.

Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
□	□	□	□	□

3. There were technical problems that made it difficult for me to hear or see the patient.

Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
□	□	□	□	□

4. I am comfortable with the telemedicine equipment used.

Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
□	□	□	□	□

5. I prefer receiving telesurgery consultations than conventional consult requests.

Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
□	□	□	□	□

6. Overall, I am satisfied with the telesurgery consult process.

Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
□	□	□	□	□

Telesurgery Patient Survey – Store-and-forward Modality

1. I have confidence that the doctor can help me by using telesurgery.

Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
□	□	□	□	□

2. I am satisfied with the time it took for me to learn about the results of my telesurgery consult.

Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
□	□	□	□	□

3. Telesurgery was more convenient than having to travel to the clinic to see the doctor.

Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
□	□	□	□	□

4. I am concerned about my privacy when telesurgery is used.

Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
□	□	□	□	□

5. I would rather have a telesurgery consult than go to see the doctor.

Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
□	□	□	□	□

6. Overall, I am satisfied with the telesurgery consult process.

Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
□	□	□	□	□

Telesurgery Referring Clinician Survey – Store-and-forward Modality

1. I get an educational benefit from the referral.

Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
□	□	□	□	□

2. I prefer telesurgery consultation to traditional referrals.

Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
□	□	□	□	□

3. My patients benefit from the telesurgery consult process.

Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
□	□	□	□	□

4. I received a timely response to my consult request.

Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
□	□	□	□	□

5. The consultant provided information that was helpful in the management of my patient.

Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
□	□	□	□	□

6. There were technical problems that made it difficult for me to send or receive the consult.

Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
□	□	□	□	□

7. Overall, I am satisfied with the telesurgery consult process.

Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
□	□	□	□	□

Telesurgery Consultant Survey – Store-and-forward Modality

1. I am confident in my diagnoses and management plans when performing telesurgery consultations.

Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
□	□	□	□	□

2. Telesurgery consultation is a more efficient use of the time I spend as a consultant.

Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
□	□	□	□	□

3. There were technical problems that made it difficult for me to send or receive the consult.

Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
□	□	□	□	□

4. I prefer receiving telesurgery consultations than conventional consult requests.

Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
□	□	□	□	□

5. Overall, I am satisfied with the telesurgery consult process.

Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
□	□	□	□	□